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Skull Valley Wildland-Urban Interface Fire Defense System Environmental Assessment

Hassayampa Field Office
21605 North 7th Avenue
Phoenix, AZ 85027
Phone: (623) 580-5500
Fax: (623) 580-5580

[Skull Valley Wildland-Urban Interface Fire Defense System]

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1. INTRODUCTION

On August 22, 2002, President Bush established the Healthy Forests Initiative (HFI). This initiative directs the Department of Agriculture, Department of the Interior (DOI), and Council on Environmental Quality (CEQ) to improve regulatory processes to ensure more timely decisions, greater efficiency, and better results in reducing the risk of catastrophic wildland fires (U.S. Forest Service [USFS] 2012).

In December 2002, the CEQ provided new guidance for the preparation of Environmental Assessments (EAs) for fuel reduction and fire-adapted ecosystem-restoration projects. This guidance included the following major points (USFS 2012):

- The EA should be a "concise public document" that addresses four elements: (1) need for the Proposed Action, (2) description of alternatives, (3) description of the environmental impacts of the Proposed Action and No Action Alternative, and (4) a list of the agencies and persons consulted;

- The EA should reference any supporting data, inventories, and other documents that were relied on in its presentation;

- Interested agencies and the public must be involved in EA preparation to the extent practicable;
- When a Finding of No Significant Impact (FONSI) is prepared, the EA should be attached and incorporated by reference;
- When the EA and FONSI are ready, reasonable public notice of their availability must be provided; and
- If an Environmental Impact Statement (EIS) is needed, a Notice of Intent (NOI) must be published describing the Proposed Action and No Action Alternative, the scoping process, and the name of the agency contact.

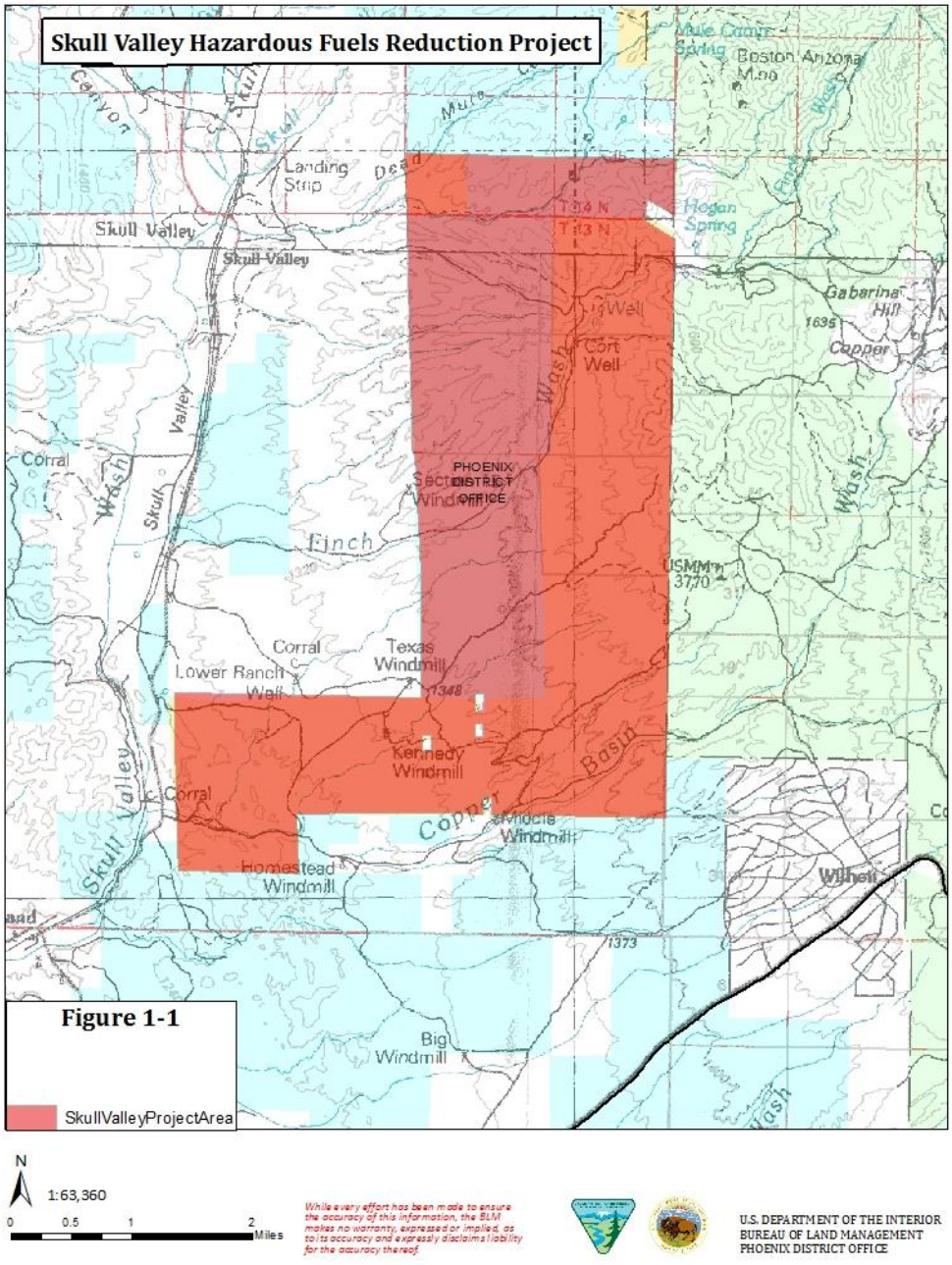
In 2003, Congress passed the Healthy Forests Restoration Act (HFRA) (Public Law [P.L] 108-148). For all EAs completed under the HFRA, the Bureau of Land Management (BLM) must use the *Guidance for Environmental Assessments for Forest Health Projects*, provided in a December 9, 2002 memorandum from the CEQ. This EA has been prepared in accordance with CEQ's guidance for preparing National Environmental Policy Act (NEPA) documents authorized under the HFRA of 2003 (USFS 2012).

This document and its analysis are tiered directly to the *PEIS Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States (BLM 2007)* which analyzed the effects of herbicides on BLM administered lands and provides an approved list of herbicides that can be used on BLM administered lands.

This document and its analysis are also tiered directly to the *Programmatic Environmental Impact Statement Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron on Bureau of Land Management Lands in 17 Western States (BLM 2016).*

The project area is located on 8,970 acres east and southeast of Skull Valley, Arizona, northeast of Kirkland, Arizona, and northwest of Wilhoit, Arizona. The project area being analyzed encompasses 5,613 acres of land managed by the BLM and 3,356 acres of land management by the Arizona State Land Department located within the Wildland-Urban Interface (WUI) of the communities of Skull Valley, Kirkland, and Wilhoit, Arizona. Conditions have resulted in fuel loading near developed areas and the project area is in need of treatment.

Figure 1.1 Location Map of Project Area



1.1 Purpose and Need for Action

The Fire Regime Condition Class (FRCC) for the most of the project area is FRCC 2 (moderate). This indicates that fire regimes and vegetation characteristics have been moderately altered from their historical range of natural variability. Fire frequencies are

departed from historical frequencies by multiple return intervals. Risk of losing key ecosystem components is moderate. The purpose for the project is to move the area toward FRCC 1.

Further, the need for the project is to reduce the intensity and severity of future wildland fires in the project area by reducing hazardous fuels on the ground and by creating a defensible buffer to provide for a safer suppression environment. Specifically, this would be accomplished by:

- Reducing shrub density from current hazardous levels
- Reducing overall fuel loading (burnable above-ground biomass)
- Reducing average height and decreasing horizontal continuity to reduce anticipated fire behavior
- Reducing shrub fuel loadings in hazard areas in order to reduce fire behavior
- Restoring native vegetation in areas where non-native and noxious weeds have taken over

1.2 Decision to be Made

The decisions to be made for this EA include the following:

- Whether or not the Proposed Action is consistent with land use plan and fire management plan for the project area;
- Whether or not to issue a FONSI or to prepare an EIS; and
- Whether or not to implement the proposed WUI treatments.

1.3 Land Use Plan Conformance

The Proposed Action is in conformance with, and tiers to the analysis presented in the Bradshaw-Harquahala Proposed Resource Management Plan/Final Environmental Impact Statement completed for the *Bradshaw-Harquahala Record of Decision and Approved Resource Management Plan (April 2010).* Desired Future Conditions and Management actions are as follows:

1.3.1 Fire Management

FM-1. Fire is recognized as a natural process in fire-adapted ecosystems and is used to achieve objectives for other resources.

FM-2. Fuels in the Wildland Urban Interface (WUI) are maintained at non-hazardous levels to provide for public and firefighter safety.

FM-3. Prescribed fire complies with Federal and State air quality regulations.

FM-4. Each vegetation community is maintained within its natural range of variation in plant composition, structure, and function, and fuel loads are maintained below levels that are considered to be hazardous

FM-8. Use suitable tools for reducing hazardous fuels, including prescribed burning, wildland fire use, and mechanical methods.

FM-10. In areas not suitable for fire where fuel loading is high, BLM will use biological, mechanical, or chemical treatments and some prescribed fire to maintain non-hazardous levels of fuels and meet resource objectives.

FM-12. In areas suitable for fire where conditions allow, BLM will do the following:

- allow naturally ignited wildland fire, use prescribed fire and a combination of biological, mechanical, and chemical treatments
- to maintain nonhazardous levels of fuels,
- reduce the hazardous effects of unplanned wildland fires, and
- meet resource objectives.

FM-16. Firefighter and public safety are the first priority in every fire management activity. Setting priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources must be based on the following:

- values to be protected,
- human health and safety, and
- costs of protection (BLM 2001b).

1.3.2 Vegetation and Riparian Management

VM-1. Maintain, restore, or enhance the diversity, distribution, and viability of populations of native plants, and maintain, restore, or enhance overall ecosystem health.

VM-8. Fuels reduction projects may include provisions for permitting firewood collection on a case-by-case basis.

1.4 Scoping & Public Participation

The BLM Interdisciplinary Team internally scoped and developed this project. The team identified the supplemental authority elements and other resources to be addressed in this document, as outlined in Section 3.4.

The EA was made available through the BLM NEPA Register for a 30-day comment period and letters were sent to interested public.

Tribal consultation letters were sent to the following tribes: Pueblo of Zuni, Yavapai-Prescott, Tohono O'odham Nation, Salt River Pima-Maricopa Indian Community, the Hopi Tribe, Gila River Indian Community, Fort McDowell Yavapai Nation, and the Ak-Chin Indian Community.

1.5 Issues Identified

During the Interdisciplinary Team Kick-Off Meeting (January 12, 2016), special concerns and design features for this project were identified. Specific issues include the following:

- Potential impacts to migratory birds and their habitat.
- Potential disturbance to wildlife species

2. PROPOSED ACTION AND ALTERNATIVES

2.1 Alternative 1 - Proposed Action

The BLM proposes to reduce hazardous fuels on 8,970 acres of public lands administered by the BLM and state lands near the communities of Skull Valley, Kirkland, and Wilhoit, Arizona, as shown on Figure 1. Treatment methods could include manual, mechanical, chemical, biological, prescribed fire, seeding, and/or activity fuel disposal.

Design features will include:

a. No new roads will be constructed

b. Best management practices and the following measures would be used to mitigate for noxious weeds and invasive plant species:

   i. Minimize ground disturbance by monitoring native grass release for at least one growing season following mowing of vegetation. Do not immediately seed since native grass release may not warrant an additional seeding treatment.

   ii. Broadcast seeding will be the preferred method for dispersing seed in order to keep the soil crust intact.

   iii. In areas where invasive and noxious weeds are known to occur (i.e. along roads, private property, etc.), yearly monitoring for weeds will take place, and subsequent treatment may occur.

c. The unit will be monitored for objective attainment for at least one growing season after initial treatment and prior to any type of seeding treatment. Results of monitoring will determine the need for seeding.

   i. Seed will be dispersed via broadcast application.

   ii. Drill-seeding will occur only in areas determined to be appropriate by the authorized officer based on recommendations from resource specialists.

iii. Seeding time of year will be determined by the authorized officer based on recommendations from resource specialists.

d. Additional out-year treatments or maintenance treatments may be conducted as monitoring indicates using methods and prescriptions as described in this EA.

e. Prescribed grazing, prescribed fire, chemicals, and seeding will be used in areas where invasive, noxious weeds have taken over to achieve type conversion back to natives. This treatment will potentially need to be repeated several years in a row to be successful.

f. Activity fuels generated from mechanical treatment will not be piled on roadways, railways, or under utility and powerlines.

g. Broadcast burning will not occur near explosive storage permits.

h. When conducting burning near powerlines, transmission lines, and power facilities, fuels would be pre-treated to avoid any damage to existing facilities.

i. A preferred seed mix will be developed that will contain species suited for the project area soil types and used as monitoring necessitates when and where feasible.

j. Depending on which treatment method(s) are selected (e.g., prescribed burning), livestock grazing may be temporarily deferred until herbaceous vegetation can be sustainably grazed. Typically six shallow rooted perennial grasses, three deep rooted perennial, or a combination of six native grasses and forbs per meter squared would allow grazing to continue as normal.

k. All hazards in the project area will be mapped using GPS and flagged prior to treatment implementation.

l. Sensitive cultural sites will be identified and avoided (may use an on-site monitor to mitigate public knowledge of site locations). Work and travel corridors will be identified as necessary.

m. Broadcast prescribed burning, pile burning and/or landings will not occur within known/identified archeological sites unless mitigated and/or cleared by an archaeologist.

n. To prevent take of migratory birds, the BLM will avoid conducting treatments in upland habitat during the migratory bird nesting season (March 1 – September 1). If treatments are planned during the migratory bird nesting season in upland habitat, the treatment area will be surveyed by a qualified biologist prior to treatment to determine if active nests and/or potential nesting substrates are present. The treatments will be designed to avoid active nests as well as potential nesting sites in vegetation that is too dense to adequately survey for active nests.

o. Standard Operating Procedures and mitigation measures identified in the Record of Decision for the *Final Programmatic Environmental Impact Statement (PEIS) — Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (2007)* would be incorporated.

Treatment methods may include:

a. **Manual** — Hand thinning: This method would utilize chainsaws or other manually operated equipment, such as weed eaters, to thin overgrown grass, brush or trees.

b. **Mechanical** — Mowing/mastication: This method involves the manipulation of wildland fuels by use of a rotary mower towed by an agricultural tractor or a bull-hog. This equipment would be used to mow or masticate shrubs where the vegetative community and terrain make it feasible. Mowing would create fuel breaks to make an area less flammable and to provide protection of urban areas. Implementation of shrub mastication will not occur all the way down to the soil in order to minimize ground disturbance. The location of mowed areas may vary depending on fuel types, topography, and the presence of cultural resources.

c. **Prescribed Fire** — Broadcast Burning: This method involves prescribed burning activity where fire is applied generally to most or all of an area within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both. A prescribed fire burn plan will be developed to: (1) mitigate escape potential, adverse soil impacts, and smoke impacts to sensitive receptors from prescribed fire,

(2) facilitate consumption and natural re-vegetation, and (3) provide for a mosaic burn pattern.

d. **Biological** — Prescribed Grazing: This is a non-mechanized treatment method based on high intensity, low-frequency livestock grazing (HILF) and would be utilized to control fuel levels, thereby reducing and/or preventing the spread of wildfire (Strand and Launchbaugh 2013, Diamond et al. 2012, Pellant et al. 2010, Nader et al. 2007). Livestock would be herded or placed in fenced areas dominated by homogenous plant communities that would be identified for targeted grazing. These communities would be limited to areas dominated by non-native invasive grasses and forbs (e.g. red brome *Bromus madritensis*) or invasive shrubs (catclaw acacia *Senegalia greggii*). . Any targeted grazing implemented by the BLM would be intensely monitored and managed to leave sufficient residual plant material after grazing for wildlife food and thermal cover as well as watershed protection and function. Prescribed grazing may be conducted by current permittees or lessees under the terms and conditions of existing grazing permits or through the issuance of a free-use grazing permit (43 CFR§§ 4130.6-2, 4130.2(2)(h)).

e. **Chemical:** This method involves treatment where BLM-approved herbicides as per the *PEIS Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States (BLM 2007) or PEIS Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron on Bureau of Land Management Lands in 17 Western States* would be applied to reduce the above-ground biomass of undesirable fuels from the existing plant communities. This method would serve to provide a break in the horizontal continuity of the existing vegetation. The herbicide would be applied to the same treatment areas as outlined in the Proposed Action. Periodic retreatment may be required. Chemicals would be applied according to label instructions.

Table 2.1 Herbicides to be Used for Treatment

Herbicide Name (Trade/Common)	Application Amount (Oz/Acre)
Imazapic/Plateau	2-3
Glyphosate/Round-up	6.2-12.4

Herbicide Name (Trade/Common)	Application Amount (Oz/Acre)
Hexazinone/Velpar L.	128-320
Imazapyr/Polaris	128-192
Tebuthiuron/Spike	30-80
Picloram/Tordon K.	10-30
Dichlorophenoxyacetic acid/2-4D	10-30
Non-ionic Surfactants	varies

f. **Seeding:** Seeding would only be conducted during optimal timeframes and with approved weed-free seed mixes. These mixes would be potentially used for rehabilitation and re-seeding of treated areas. These seed mixes may be modified in the future, as approved by the BLM, and may include the following:

Cool season perennial grasses:

Bottlebrush squirreltail	*Elymus elymoides*

Warm season perennial grasses:

Sideoats grama	*Bouteloua curtipendula*
Cane beardgrass	*Bothriochloa barbinodis*
Curly mesquite	*Hilaria belangeri*
Vine mesquite	*Panicum obtusum*
Purple threeawn	*Aristida purpurea*
Red threeawn	*Aristida purpurea var. longiseta*
Cane beardgrass	*Bothriochloa barbinodis*
Black grama	*Bouteloua eriopoda*
Blue grama	*Bouteloua gracilis*
Hairy grama	*Bouteloua hirsuta*
Slender grama	*Bouteloua repens*
Red grama	Bouteloua trifida

Annual grasses:

Sixweeks threeawn	*Aristida adscensionis*
Mucronrate sprangletop	*Leptochloa panicea spp. uninervia*
Rothrock grama	*Bouteloua rothrockii*

Witchgrass	*Panicum capillare*
Mexican panicgrass	*Panicum hirticaule*
Small fescue	*Vulpia microstachys*
Sixweeks fescue	*Vulpia octoflora*
Arizona signalgrass	*Urochloa arizonica*
Eastwood fescue	*Vulpia microstachys var. ciliata*

Perennial Forbs:

Desert globemallow	*Sphaeralcea ambiqua*
Bluedicks	*Dichelostemma capitatum*
Largeflower onion	*Allium macropetalum*
Slimleaf bursage	*Ambrosia confertifolia*
Wright deervetch	*Lotus wrightii*
Parry penstemon	*Penstemon parryi*
Desert penstemon	*Penstemon pseudospectabilis*
Desert tobacco	*Nicotiana obustifolia*
Desert senna	*Senna covesii*
Desert-holly	Acourtia nana
Pink perezia	Acourtia wrightii
Trailling four-o'clock	Allionia incarnate
Narrowleaf silverbrush	Argythamnia lanceolata
Perennial rockcress	Arabis perennans
Desert marigold	Baileya multiradiata
Wavyleaf Indian paintbrush	Castilleja applegatei spp. martinii
Desert Mariposa lily	Calochortus kennedyi
Sego lily	Calochortus nuttallii
Desert trumpet buckwheat	Eriogonum inflatum
Desert larkspur	Delphinium parishii

Annual Forbs:

Annual agoseris	Agoseris heterophylla
Western fiddleneck	Amsinckia tessellate
Astralagus	Astralagus spp.
Exserted Indian paintbrush	Castilleja exserta spp. exserta
Pitseed goosefoot	Chenopodium berlandieri
Cryptantha	Cryptantha spp.
American wild carrot	Daucus pusillus
Skeleton buckwheat	Eriogonum deflexum

Sorrel buckwheat	Eriogonum polycladon
Spreading fleabane	Erigeron divergens
Bull filaree	Erodium texanum
Mexican gold poppy	Eschscholzia californica spp. mexicana
Euphorbia	Euphorbia spp.
Foothill deervetch	Lotus humistratus
Lomatium	Lomatium spp.
Arizona lupine	Lupinus arizonicus
Fendler desert dandelion	Malacothrix fendleri
Spring evening primrose	Oenothera primiveris
Desert Indianwheat	Plantago ovata
Wolly Indianwheat	Plantago patagonica

If necessary, seeded areas may be fenced temporarily using a BLM-approved design. Fences would be aligned to avoid cultural resources and would be removed once objectives for the treatment unit are achieved.

The BLM would establish monitoring sites within proposed treatment locations and would collect baseline vegetation data prior to the implementation of any treatments. This would eliminate the unnecessary seeding of areas that may be able to reestablish naturally. Follow-up monitoring after treatments have occurred would allow the BLM to evaluate seeding success. In addition, the BLM would conduct yearly monitoring of areas known to contain noxious weeds and non-native invasive species. When necessary, these areas would be treated using various treatment methods (e.g. prescribed grazing, chemical application, mowing). Monitoring would evaluate land health and would ensure the BLM conducts maintenance treatments when necessary.

g. **Activity Fuels Disposal Methods**

i. Biomass Utilization: This method of activity fuel disposal involves the removal of biomass from the site and would involve the following design features:

A. Activity fuel may be made available to the public as mulch (would need to be chipped).

B. Activity fuel may be made available for sale for commercial biomass utilization.

C. All biomass utilization would be collected using existing and/or designated routes. No new routes would be created.

ii. Pile Burning: Pile burning is preferred in the spring, fall, or winter. A burn plan will be prepared and a smoke permit will be obtained from the Arizona Department of Environmental Quality (ADEQ) prior to implementation of burning.

A. Burn piles should not exceed 10’ long x 10’ wide x 6’ high;

B. Burn piles will be piled with fine fuels and slash on the interior and larger fuels on the exterior;

iii. Chipping: This would include the use of a chipper to dispose of activity fuels generated from other methods. The chips would either be spread and left on-site, hauled off, or made available to the public.

2.2 Alternative 2 - No Action

The BLM would not implement fuel reduction treatments in the identified project area. Other authorized uses within the proposed project areas would continue.

3. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This section describes the existing condition of the potentially impacted resources and how they would or might be affected by the proposed action and alternatives.

3.1 Definition of Terms

According to 40 CFR 1508.8 (U.S. National Archives and Records Administration 2012):

> "'Effects' include:
>
> (1) Direct effects, which are caused by the action and occur at the same time and place.
>
> (2) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. The environmental effects of the Proposed Action and No Action Alternative described in this EA are primarily derived through the analysis of the expected changes that implementation of each alternative would have on the existing conditions of the resources described in the below sections.

3.2 Cumulative Effects Study Area

The Cumulative Effects Study Area is defined as a three-mile buffer around the project boundary.

3.3 Past, Present and Reasonably Foreseeable Future Actions

3.3.1 Past and Present Actions

- Past wildfire activity
- Livestock Grazing
- Dispersed recreation (hunting, motorized and non-motorized use, etc.)

- Existing authorizations (powerlines, roads, transfer station, etc.)
- Commercial and residential development on nearby private land
- Mining activity

3.3.2 Reasonably Foreseeable Future Actions

All of the actions listed above are expected to continue into the foreseeable future.

3.4 Analysis of Resources

Table 3.1. Resources and rationale for detailed analysis

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
Vegetation			X	See Section 3.5
Soils			X	See Section 3.6
Non-native Invasive and Noxious Species			X	See Section 3.7
Cultural Resources			X	See Section 3.8
Special Status Species	X			The project area does not contain habitat for threatened or endangered species, or species proposed threatened or endangered. There are no documented occurrences of BLM sensitive species in the project area.
Migratory Birds			X	See Section 3.9
Fish and Wildlife			X	See Section 3.10
Fire Management			X	See Section 3.11

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
Air Quality			X	See section 3.12
Rangeland Management			X	See Section 3.13
Visual Resources		X		Treatments would be implemented to conform to the goals and objectives of the applicable VRM classes.
Areas of Critical Environmental Concern	X			Resource is not present.
Environmental Justice	X			None of the alternatives would disproportionately impact any low income of minority populations as described in Executive Order 12898.
Farmlands (Prime and Unique)	X			Resource is not present.
Floodplains	X			Resource is not present.
Native American Religious Concerns		X		As required by the AIRFA (42 U.S.C. 1531) and the NHPA (16 U.S.C. 1531), local Native American tribes were notified of the Proposed Action during the coordination process of this project.
Recreation		X		Design features of the proposed action have been included to avoid impacts to this resource.

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
Wastes (Hazardous and Solid)	X			This action is not anticipated to generate any hazardous or solid waste.
Water Quality (Surface and Ground)		X		Project implementation would not affect the quality and/or quantity of ground or surface water.
Wetlands and Riparian Zones		X		Riparian vegetation is present within the project area along portions of Copper Basin Wash, but treatments will not take place in riparian areas so this resource is not affected.
Wild and Scenic Rivers	X			Resource is not present.
Wilderness	X			Resource is not present.

3.5 Vegetation

3.5.1 Affected Environment

The primary plant community found within the project area is Interior Chaparral. The vegetation is dominated by shrubs with small, thick, evergreen leaves and wide-spreading, deep root systems. Historic fire was an important component of the ecosystem (Pase and Brown 1982a). As such, the shrubs are well adapted to fire and reproduce readily from heat-scarified seed that is stored in soil for decades. Some species readily sprout from root crowns after fire. The dense compacted leafy growths of the shrubs are naturally flammable, which leads to a high fire hazard. The eastern portions of the project area are dominated by bunch grass species, including sideoats grama, ring muhly, black grama, and squirreltail. Shrubs include snakeweed, apache plume, and barberry. The western and rolling hill portions of the project area are dominated by Sonoran scrub oak and catclaw mimosa. Other shrubs include desert ceanothus, snakeweed, juniper, and fairyduster. Shrub cover in the western portion of the project area is

nearly contiguous in many of the upland areas, particularly along north and western facing slopes.

3.5.2 Proposed Action

The Proposed Action would have a direct impact on existing vegetation communities in that hazardous fuel reduction would occur to decrease the probability of catastrophic wildfire from occurring (Paysen et al. 2000). Over the long-term, the Proposed Action would reduce hazardous fuels using management tools such as prescribed fire, mechanical, biological (including livestock grazing), and chemical treatments. Vegetation communities should return to their historic range of variability with regards to fuel load and type. Also, the natural occurrence of fuels and the historic fire regime reflective of a vegetation community should occur. The indirect effect on vegetation from hazardous fuels reduction by prescribed fire, mechanical, biological, and chemical tools would be primarily short-term and would be in the form of soil erosion, inadvertent damage to habitat, and potential damage to both targeted and non-targeted species. However, vegetation is resilient and recovery should be short term.

Fuels reduction treatments would need to be re-administered every few years to maintain the normal range of variability. The removal of diseased, invasive, and overstocked plants would encourage the growth of healthy forest and rangeland vegetation. Under certain conditions, the re-seeding of desirable plant species may be necessary to inhibit weed establishment in areas where fuel reduction treatments have been implemented.

3.5.3 No Action Alternative

This alternative would result in no new impacts to vegetation communities. All wildfires, regardless of ignition source, would be suppressed in accordance with the current land use plan and fire management plan. The primary impact would be the continuation of periodic wildfires, potentially including large catastrophic wildfires (Brown 2000). It is anticipated that the number and acres burned will increase in future years following the trend in past years. Under the No-Action Alternative, hazardous fuels will continue to accumulate at rates respective to past years. The accumulation of hazardous fuels is a continuing concern especially in the wildland urban interface. Continuation of the current policies could also lead to changes in the composition and structure of vegetation communities that eventually may cause a loss of native plant diversity (Brown 2000). Fire dependent plant communities would continue to change as a result of continued fire suppression.

3.5.4 Cumulative Effects

There may be cumulative effects to vegetation when this action is combined with the effects of continued livestock grazing, dispersed use of off-highway vehicles, and ground clearing related to development on public land and nearby private lands. Vegetation may be damaged from

being eaten, crushed, or completely removed. Additionally, there may be re-vegetation efforts for construction areas on public land and some private land where required by development authorizations.

3.6 Soils

3.6.1 Affected Environment

The soils within the project area are diverse and associated with a variety of climates, vegetative cover, topography, and geology. The dominant soil orders in the proposed treatment areas are Aridisols, Entisols, and Mollisols. The soils dominantly have a thermic or mesic soil temperature regime, an aridic or ustic soil moisture regime, and loamy or mixed mineralogy and formed in alluvium. They are very shallow to very deep and are well drained and somewhat excessively drained. The Lonti series (Ustollic Haplargids) is found on fan terraces and comprises approximately 56% the project area. Rough broken land and rockland occupy approximately 20% of the project area. The remainder of the soils are Ustollic Calciothids and Haplargids, Typic Calciorthids and Ustorthents, Cumulic Haplustolls, and Lithic Torriorthents and Haplustolls.

3.6.2 Proposed Action

Prescribed fires and mechanical fuel reduction treatments would directly impact soil by increasing erosion rates due to fireline construction, if needed, especially on steeper slopes. Heavy equipment could increase soil compaction, slowing the re-establishment of vegetative cover. Chemical fuel reduction treatments may leave residues that can alter soil microbial populations or vegetative recovery, affecting the productivity of the soil and increasing the vulnerability to erosion. Over time, less mechanical and chemical fuels treatments would be needed to reduce fuel loads. Prescribed fire can also impact soil properties and permeability, especially if fires are allowed to reach higher temperatures. However, the frequency and intensity of the fires would decrease over time as fuel loads decrease, reducing some of the impacts on soil properties. Fire alters the microbial communities and nutrient cycling. Microbial populations can shift after fires or decline entirely for periods of time depending on the intensity of the fire. However, fire effects on soil microorganism communities are complex and not fully understood. Fire also effects nutrient cycling, primarily by increasing the pH in more acidic soils, which would affect nutrient availability to plants. However, arid and semi-arid soils, like those common in the project area, are typically alkaline, and therefore pH is less likely to be affected (Clark, 2001).

Fire does increase nitrogen available for plant growth by converting nitrogen previously bound in unavailable forms, such as organic matter or woody material, into ash and a more plant available form of nitrogen (ammonium). However, total nitrogen decreases from losses

due to erosion or volatilization. Over time, nutrient deficiencies, particularly nitrogen, may result (Caldwell et.al., 2002; Macadam, 1989). Sulfur and phosphorous are also more readily lost, but to a lesser extent. Information is conflicting on the impact of these changes in nutrient availability, and the degree of long-term nitrogen loss is largely dependent on the intensity and frequency of the fire.

The occurrence of catastrophic wildfires should decrease over time as fuel loads decline. Reducing severe wildfires can protect soils from long-term damage and degradation of the soil properties, fertility and structure. Improving the long-term stability of the soils also improves the viability of the native fire-adapted vegetative communities the soil supports. Fire-adapted areas are less likely to be affected by repeated cycles of nutrient losses, and frequent, low-temperature fires have fewer and shorter-lived effects on soils (McNabb, et al., 1990). Additionally, recent studies have shown erosion and sedimentation is up to 10 times lower following prescribed fires compared to high intensity wildfires (Wohlegmuth et.al. 1999).

3.6.3 No Action

Suppression of all wildfires in accordance with the current BLM fire management plans would have no new impact on soils. Existing impacts in fire-affected areas include greater susceptibility to accelerated soil erosion and sedimentation due to fire suppression activities and the loss of vegetative cover. The severity of the erosion is dependent on soil texture, slope, vegetative cover return intervals, and the precipitation intensity after the soil is disturbed. At the same time, the absence of fire can lead to greater fuel loads that could increase the frequency and intensity of fires in the long-term. As the intensity of the fire increases, the severity and duration of impacts on soils also generally increases.

Fire affects the physical, chemical, and microbial properties of soil. Catastrophic, high intensity fires have the most severe and long-lasting negative impact on soils. Higher temperature fires occur where thick, dry litter layers accumulate, heating soils to a greater depth (up to 4 inches) and a higher surface temperature (approximately 750°F or higher) compared to lower intensity fires (less than 1 inch and 250°F or lower). Above ground vegetative cover and organic matter and below ground root systems provide structure and stability for the soil. Intense fires remove organic matter and vegetative cover more completely and deeply, leaving soil more susceptible to large-scale, accelerated erosion.

Soil heating also reduces soil organic matter and can cause shifts in microbial populations that affect nutrient cycling. Organic matter helps regulate soil moisture, the carbon/nitrogen ratio, microbial populations, and maintains soil structure, porosity and cation exchange capacity. Although many soils on BLM administered land in Arizona are low in organic matter, even small amounts contribute to these important soil properties.

One of the more severe effects of fire on soils is the formation of water-repellent layers through heating of organic compounds. This phenomenon, known as hydrophobicity, most commonly occurs on dry, coarse textured (sandy) soils that support shrub vegetation communities, such as chaparral. Hydrophobicity is most severe in soils heated to intermediate temperature (approximately 350 to 550°F). The formation of water-repellent layers can dramatically increase soil erosion, directly by inhibiting moisture infiltration, and indirectly by inhibiting vegetative recovery. Higher intensity fires can also increase impermeability in the limited areas with soils containing higher clay content.

Fire suppression is preferred on BLM administered lands with soils supporting non-fire adapted vegetation. These non-fire adapted areas are generally characterized by soils that are low in nutrients, organic matter and water holding capacity, and associated with arid or semi-arid environments. These characteristics would indicate slow fire return intervals, which would prolong the exposure of the soil surface to accelerated erosion from wind or precipitation. Soils on steeper slopes are especially vulnerable.

3.6.4 Cumulative Effects

Under the proposed action, the occurrence of catastrophic wildfires should decrease over time as fuel loads decline. Reducing severe wildfires can protect soils from long-term damage and degradation of the soil properties, fertility and structure. Improving the long-term stability of the soils also improves the viability of the native fire-adapted vegetative communities the soil supports. Fire-adapted areas are less likely to be affected by repeated cycles of nutrient losses, and frequent, low-temperature fires have fewer and shorter-lived effects on soils (McNabb, et al., 1990). Additionally, recent studies have shown erosion and sedimentation is up to 10 times lower following prescribed fires compared to high intensity wildfires (Wohlegmuth et.al. 1999). Under the No Action alternative, the treatments would not occur and the effects to soil from more severe wildfires could lead to cumulative impacts when combined with other ground disturbing activities in the area, including mining activity, private land development, and dispersed recreational use of off highway vehicles.

3.7 Non-native Invasive and Noxious Weeds

3.7.1 Affected Environment

Vegetation communities in Arizona have been impacted by the introduction of invasive species or noxious weeds (Howery et al. 2009). The ability of noxious weeds to become established and dominate would be reduced under the Proposed Action. Presently these species have not been documented within the proposed project areas. Complete inventories of the surrounding areas have not been completed and the best available data is as follows: within Yavapai County, a number of invasive weeds have been identified. Among these weeds are several species of

thistle, including bull, malta star, yellow star, scotch and musk, in addition to camelthorn, dalmation toadflax, diffuse, russian and spotted knapweed, halogeton, hoary cress, jointed goatgrass (Howery et al. 2009).

3.7.2 Proposed Action

The risk of weed introduction would be reduced after management ignited fire with the re-establishment of perennial grasses, forbs, and shrubs creating an environment where noxious and invasive weeds would be less competitive. Proposed action design features would be implemented to reduce the potential spread of noxious and/or invasive weeds during fuels management treatments. As a result of pre-project planning and proper post-fire management of livestock grazing and recreational use, the potential for noxious and invasive weeds establishment and spread could be reduced.

3.7.3 No Action

In the short-term, the risks of invasive weed increase would be similar to what is naturally occurring in the propose project area.

In the long-term the frequency of large, hot fires would continue to increase. Larger burned areas and fewer unburned islands within the burn would lead to longer recovery periods following the fire. Natural regeneration processes for species which do not re-sprout after a fire would take longer due to the size of the burned area. This would decrease the edge effect for airborne seed establishment of native vegetation and result in longer periods of vulnerability to noxious and invasive species. This would increase the potential for the spread of invasive weeds and the potential of noxious weeds into the burned areas over the long-term. Burned areas would result in new succulent growth as well as open up areas that have before been inaccessible to livestock and wildlife due to extensive vegetative growth.

3.7.4 Cumulative Effects

There may be cumulative effects to noxious and invasive species when this action is taken in combination with the possibility of weed infestation and spread from seeds carried by livestock or recreationists and their vehicles. This action may provide additional opportunities to establish, although the design features included in the Proposed Action have been designed to minimize this impact.

3.8 Cultural Resources

3.8.1 Affected Environment

The American Indian Religious Freedom Act of 1978 (AIRFA) and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) protect traditional cultural properties. The

National Historic Preservation Act (NHPA) is legislation intended to preserve historical and archaeological sites in the United States. This act requires federal agencies to evaluate the effects of all federally funded or permitted projects on historic properties through a process known as "Section 106 Review." BLM compliance with Section 106 of the NHPA is principally accomplished through the State Protocol Agreement between the BLM and SHPO. This agreement establishes procedures undertaken by the BLM to evaluate cultural resources. Specifically, this agreement streamlines the Section 106 process by eliminating case-by-case consultation with SHPO on undertakings that culminate in no effect or no adverse effect determinations. A determination of adverse effects requires that BLM consult with SHPO per the regulations at 36 CFR 800 (BLM 2012e).

The BLM HFO has documented that approximately seven cultural resource investigations have been completed in, or near, the project area according to the records review of both AZSITE and BLM records and maps. All of these previous surveys are considered adequate. Some inventories located within current project treatment units were linear in scope. The previous surveys documented in total do not completely cover the proposed treatment units. Therefore, in compliance with Section 106 of the NHPA, as amended, the BLM would conduct an appropriate level of inventory in all treatment units prior to project implementation so that cultural resource sites could be recorded and avoided.

Previously conducted cultural resource inventories have identified 12 sites within the proposed treatment units, all of which are located on BLM lands. Site types recorded during these inventories included dispersed prehistoric sites consisting primarily of temporary prehistoric campsites with artifact concentrations, sherd scatters, lithic scatters, pithouses, and habitation structures. Of these sites, the data was not able to reflect that any are considered eligible, six sites had no data in AZSITE or BLM records and maps regarding location or National Register eligibility, one site, AZ N:10:2(BLM) is not considered eligible and 11 sites have not been previously evaluated according to AZSITE and BLM records and maps.

3.8.2 Proposed Action

The BLM would avoid all cultural resources identified in the project area, utilizing the standard avoidance procedures outlined in the Arizona State Protocol Agreement between the AZ BLM and AZ SHPO. Therefore, no significant, adverse impacts to cultural resources or their elements for inclusion on the National Register are anticipated under implementation. In the proposed action alternative, indirect, beneficial effects to cultural resources may be realized because of decreased hazardous fuels and the subsequent reduction in the number and severity of wildland fires.

By reducing surrounding combustibles and other vegetative matter without removing so much ground cover that the resources are easily seen, especially in cases where there is a nearby road

or trail, the proposed action may help conceal sites and prevent any wildfire from damaging the resource.

3.8.3 No Action

Under the No Action Alternative, no ground-disturbing activities would take place. As a result, wildfires may become more likely within the treatment units and cultural resources may be at an increased risk of damage from wildfire. Wildfire is generally more destructive to cultural resources than prescribed fire, since it includes both uncontrolled fire effects and the effects of fire suppression.

Currently, any archaeological and historic resources that may exist in the area are in danger of impacts from wildfire including spalling of rock surfaces, resultant runoff and erosion of sites, increased visibility of sites, and increased access and potential for looting.

3.8.4 Cumulative Effects

Under the proposed action no cumulative impacts to cultural resources are anticipated. Design features have been included to avoid damage to cultural resources.

3.9 Migratory Birds

3.9.1 Affected Environment

All migratory birds are protected under the 1918 Migratory Bird Treaty Act (16 USC 703), as well as the Neotropical Migratory Bird Conservation Act (16 USC Chapter 80). Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds requires the BLM and other federal agencies to work with the U.S. Fish and Wildlife Service (USFWS) to improve protection for migratory birds. Arizona Partners in Flight (APIF) has identified more than 500 bird species in Arizona (Latta et al. 1999). Of the more than 500 species, 238 species are considered neotropical migrants. Important habitat for migratory birds in the Hassayampa Field Office includes riparian, desert scrub, and desert grassland habitat. Migratory birds that are likely to occur within and near the treatment areas include, but are not limited to, Bell's vireos, black-chinned sparrows, Costa's Hummingbirds, Cooper's hawks, loggerhead shrikes, Lucy's warblers, and yellow warblers.

3.9.2 Proposed Action

The vegetation treatment activities described in the proposed action could potentially result in the destruction of active migratory bird nests, eggs or could potentially kill juvenile birds. Destruction of active nests, eggs or mortality to migratory birds is a violation of the Migratory Bird Treaty Act. During vegetation treatments, the presence of crews and equipment could disrupt activities, such as foraging and breeding. Smoke associated with pile burning and

broadcast burning could cause nesting birds to leave their nests, which could reduce reproductive success. These potential impacts to nesting birds are unlikely to occur because the treatments will likely take place outside the migratory bird nesting season (March 1 – September 1). If it is not feasible to conduct treatments outside of the nesting season, nest searches by a qualified biologist would be conducted prior to treatment to identify avoidance areas, thus reducing the risk of take of, or disturbance to, migratory birds.

The vegetation treatments would result in a reduction of nesting and foraging habitat for migratory birds in the treatment areas. The extent of impacts would depend on the amount and type of vegetation removed. Reducing fuel loading in the treatment areas would reduce the risk of habitat impacts associated with high intensity wildfire.

3.9.3 No Action

The impacts mentioned in the proposed action would not occur. Fuel loading in the WUI area would remain high, which would increase the risk of high intensity wildfire. High intensity wildfire could result in impacts to wildlife habitat through loss of vegetation, increased soil erosion and changes in plant community structure.

3.9.4 Cumulative Effects

There may be cumulative effects to migratory birds when this action is taken in combination with the additional pressures of displacement and disturbance from recreationists and their vehicles and ground disturbance and noise from development on public land and nearby private lands.

3.10 Fish and Wildlife

3.10.1 Affected Environment

Wildlife species that occur within and adjacent to the treatment area vary depending on the vegetation, substrate type and topography. Wildlife species that can be found in and adjacent to the treatment area includes, but is not limited to mule deer, javelina, mountain lion, Gambel's quail, mourning dove, and various other snakes, lizards, amphibians, small mammals and birds.

3.10.2 Proposed Action

Displacement or mortality to individuals could occur during treatment operations. Vegetation treatments would result in loss of cover, forage and nesting habitat for a variety of wildlife species. The effects of vegetation manipulation on wildlife depend on vegetation structure, production, and phenology of the community. Because these characteristics relate to seasonal cover and food requirements for particular animal species – and the predators that depend on them – and because these characteristics respond differently to different vegetation

manipulations, effects on wildlife from vegetation management would range from negative to positive, depending on the species affected and the type of treatment used. Wildlife species that utilize early successional vegetative communities would also be expected to benefit from the Proposed Action. Reducing fuel loading in the treatment areas would reduce the risk of habitat impacts associated with high intensity wildfire.

3.10.3 No Action

The impacts mentioned in the proposed action would not occur. Fuel loading in the WUI area would remain high, which would increase the risk of high intensity wildfire. High intensity wildfire could result in impacts to wildlife habitat through loss of vegetation, increased soil erosion and changes in plant community structure.

3.10.4 Cumulative Effects

There may be cumulative effects to wildlife when this action is taken in combination with the additional pressures of vegetation removal from livestock grazing, displacement and disturbance from recreationists and their vehicles, and ground disturbance and noise from development on public land and nearby private lands.

3.11 Fire Management

3.11.1 Affected Environment

The proposed treatment units are located within Fire Management Unit (FMU) 3 (HFO Bradshaws 3,500' North) as designated in the Phoenix District Fire Management Plan (BLM 2013). This FMU is made up of brush and grassland vegetation within the Hassayampa Field Office. The southern boundary is the vegetation change from Sonoran Desert to brush and grassland at around 3,000 feet in elevation across the southern end of the Bradshaw Mountains; the western portion is between the Prescott National Forest and the Phoenix District/Colorado River District boundary. It also includes the Highway 69 corridor from I-17 toward Prescott bordered by the Prescott National Forest.

FMU 3 spans an immense area from central Arizona north to the Utah and New Mexico borders. Fire years are typically correlated with above normal precipitation in the spring, which occurs about every seven years. Historic fire regimes vary across the FMU due to the presence of different ecosystems. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the possible influence of aboriginal fire use.

Chaparral as a general vegetation type evolved with fire as a natural component of the ecosystem and is maintained in a healthy state by regular burning. The chaparral in the Phoenix District is

more open and has a mixture of upper Sonoran Desert vegetation. Natural fires in these areas were probably less common than typically occur in chaparral vegetation in general.

There has only been one reported fire within the project area since 1980. That fire was the Hidden fire in 2003 which occurred on state managed land on the far north end of the project area. The Hidden fire burned only .1 acres.

3.11.2 Proposed Action

Fire behavior should be decreased as a result of reduced fuel loading and continuity. Future natural fires within the proposed project area should be less extensive and smaller in size. Smaller wildfires should be easier to manage, reducing the risk to multiple natural resources, private lands, private withholdings, physical structures associated with rights-of-way, and aesthetic values. Future fires should mimic natural severity. The danger of large, uncontrolled wildfires should be reduced under this alternative. Under the Proposed Action, implementation of the treatments should move the project area toward a more natural vegetative community with manageable fuel loading (FRCC 1) by reducing fuel loading and continuity, and establishing more perennial grass and forb species which naturally occur within the ecological site potential. Studies have shown that fuels treatments conducted prior to a large, uncontrolled fire event reduce fire burn severity and extreme fire behavior. These treatments modify stand structure and extreme wildfire behavior. In a report written by the Apache-Sitgreaves National Forest in 2002 titled, "Rodeo-Chediski Fire Effects Report", studies showed the lessening of burn severity on treated areas prior to a wildfire burning through the area.

3.11.3 No Action

Fuel conditions could continue to increase and accumulate beyond levels representative of the natural (historic) fire regime which could increase the burn intensity potential. The risk of a large, uncontrolled wildfire could remain much greater. If a wildfire does occur in the area, fuel loading and the associated fire intensity should be increased. The No Action Alternative should result in high fuel loading, continuity and fire intensity potential in the long-term.

3.11.4 Cumulative Effects

Past actions, including wildfire and previous treatment of wildland urban interface projects, along with livestock, wildlife use, land actions, and recreation activities may have affected fire and hazardous fuels on areas outside the proposed project area. These activities have created varying ecological conditions. Implementing the Proposed Action, combined with past actions, could result in ecological conditions that meet site potential and mimic the natural disturbance regime. This would provide a mosaic of differing ecological conditions which would increase the vegetative communities' resiliency to future disturbances while reducing and minimizing

cumulative effects associated with disturbances. The potential exists for future wildfire events and wildland fire use for resource benefits to occur, although it cannot be determined at this time how many could occur and acres that could be affected. With foreseeable wildfires, rehabilitation of these areas could also occur, although it cannot be determined at this time how many could occur and acres that could be affected.

3.12 Air Quality

3.12.1 Affected Environment

The current condition of air quality in the planning area is good, relative to other areas of the nation. The proposed project is within the Phoenix airshed, however, none of the treatment units are within any of the non-attainment areas for ozone, carbon monoxide, PM_{10} or $PM_{2.5}$.

3.12.2 Proposed Action

During project implementation, short-term consequences could occur in the form of fugitive dust and/or smoke if pile burning or broadcast burning occurs or operating equipment or vehicles to access the project area and conduct the treatments. However, once the active burning concludes for the day or for project completion, the air quality would return to its present condition. The potential exists for future wildfire events to produce smoke and fugitive dust related to suppression activities, which may be reduced due to reduced fire intensity following successful fuels treatments.

3.12.3 No Action

Under the No Action Alternative, no proposed WUI treatment activities would occur to reduce the potential for wildland fire. As a result, the potential for smoke impacts from wildfire events would remain due to continued hazardous fuel accumulation. As fuel loads increase over time, the risk of wildfire also increases. Impacts to air quality from wildfires depend on the amount of biomass material consumed and atmospheric conditions. High-intensity wildfires with heavy fuel loadings result in a high level of emissions.

3.12.4 Cumulative Effects

Implementing the Proposed Action and continued occurrence of other land use activities could continue to have short term consequences to the air quality. The potential exists for future wildfire events and wildland fire use for resource benefits to occur, although it cannot be determined at this time how many could occur and acres that could be affected. With foreseeable wildfires, rehabilitation of these areas could also occur, although it cannot be determined at this time how this would affect the air quality.

3.13 Rangeland Management

3.13.1 Affected Environment

There are four grazing allotments located within the project area. The allotments are listed in the table below.

Table 3.2 Grazing allotments within project area.

Allotment	Stocking Rate	Livestock Class	Season of Use
Foraker	15	Cattle	Yearlong
W Diamond	32	Cattle	Yearlong
Kennedy	30	Cattle	Yearlong
Quarter Circle J	12	Cattle	Yearlong

These allotments are generally used as winter pastures in association with higher elevation allotments. Livestock are authorized to be present on the allotments year-round, and livestock numbers may be higher within the allotment boundaries due to private land and state land grazing leases. Range facilities present on the allotments include boundary fencing, corrals, and water facilities, primarily windmill driven wells.

Several vegetation monitoring plots are located within the project area. These plots are used to evaluate rangeland health and trends in vegetation communities on a long-term basis.

3.13.2 Proposed Action

Under the proposed action, short to medium term disruption to grazing systems on the allotments is expected. Manual and biological control methods are not expected to impact annual livestock operations beyond the duration of the treatment. Broadcast burning may require removal of livestock from the burn area until vegetation has re-established in the area and can support livestock utilization. This may require adjustment of livestock rotation and distribution within the allotments for up to 3 years or until monitoring data shows sufficient vegetation recovery. Due to the stocking rates on these allotments and the general availability of other areas to locate livestock within the allotments, this disruption is expected to be minimal. Smaller treatment areas may require temporary fencing to prevent livestock access. Cumulatively, treatment and reduction of native increaser shrub species and non-native plants is expected to increase feed availability and quality for grazing species.

Vegetation monitoring plots may need to remain untreated, and paired with treated plots to evaluate efficacy of treatment. As historic data is limited on these plots, no major effect to trend data is expected in the case of inadvertent treatment. Non-mechanical or biological treatments have the potential to cause damage to range facilities. These facilities should be avoided during burn operations.

3.13.3 No Action

Under the no action alternative, rangeland management and livestock grazing activities will continue to occur on the associated grazing allotments.

3.13.4 Cumulative Effects

Implementation of the proposed action is expected to modify livestock distribution within the allotments as projects are completed. Increased native forage availability and distribution will lead to greater dispersal of livestock throughout the project area. Livestock are expected to more readily utilize treatment areas following reductions in brush density, allowing for more uniform use patterns within the allotments. With the relatively small size of these grazing allotments, these changes in use patterns and disruptions to grazing operations during treatment activities are expected to have minimal effects on the livestock operations within the project area. Even when considered in combination with other ground disturbing activities that may be temporarily or permanently removing forage, the incremental impact that would result from the Proposed Action is minimal.

4. PARTIES CONSULTED

- Arizona State Forestry
- Arizona Game and Fish
- Arizona State Historic Preservation Office
- Prescott National Forest
- Yavapai County
- Permittees (Livestock grazing)
- Ak-Chin Indian Community
- Fort McDowell Yavapai Nation
- Hopi Tribe
- Hualapai Tribe
- Pueblo of Zuni
- Salt River Pima-Maricopa Indian Community
- Yavapai-Apache Nation
- Yavapai-Prescott Tribe
- Western Watershed Project
- Center for Biological Diversity
- Arizona Cattlemen's Association
- U.S. Fish and Wildlife Service
- Nature's Feel
- Arizona Off-highway Vehicle Coalition
- Arizona Wilderness Coalition

5. LIST OF PREPARERS

Name	Title
Joshua Tibbetts	Fire Management Specialist
James Holden	Rangeland Management Specialist
Codey Carter	Wildlife Biologist
Gloria Tibbetts	Planning and Environmental Coordinator
Christopher McLaughlin	Archaeologist

6. REFERENCES

Apache-Sitgreaves National Forest. 2002. Rodeo-Chediski Fire Effects Report.

Brown, J.K. 2000. Chapter 9: Ecological Principles, Shifting Fire Regimes and Management Considerations. Pp. 185.203 In: Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen.Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Bureau of Land Management. 2010. Bradshaw-Harquahala Resource Management Plan. U.S. Dept. of the Interior, Bureau of Land Management, Lower Gila Resource Area, Arizona.

Bureau of Land Management. 2013. Phoenix District Fire Management Plan.

Caldwell, T.G., D.W. Johnson, W.W. Miller, and R.G. Qualla. Forest floor carbon and nitrogen losses due to prescribed fire. Soil Sci. Soc. Am. J. 66:262-267.

Clark, B. 2001. Fire Effects Guide. National Wildfire Coordinating Group. U.S. Fish and Wildlife Service.

Diamond, J. M., Call, C. A., & Devoe, N. 2010. Effects of targeted cattle grazing on fire behavior of cheatgrass-dominated rangeland in the northern Great Basin, USA. International Journal of Wildland Fire, *18*(8), 944-950

Howery, L.D., E. Northam., and W. Meyer. 2009. Non-native Invasive Plants of Arizona. University of Arizona Extension, Tucson Arizona.

Latta, M.J., C.J. Beardmore, and T.E. Corman. 1999. Arizona Partners in Flight Bird Conservation Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report 142. Arizona Game and Fish Department, Phoenix, Arizona.

Macadam, A. 1989. Effects of prescribed fire on forest soils. B.C. Ministry of Forests, Smithers, B.C.Research report 89001-PR.

McNabb, D.H., and Swanson, F.J. 1990. Chapter 14: Effects of fire on soil erosion. In: Natural and prescribed fire in Pacific Northwest forests. (eds.) Walstad, J.D., et.al. Corvallis, OR: Oregon State University Press.

Nader G, Henkin Z, Smith E, Ingram R, Narvaez N. 2007. Planned herbivory in the management of wildfire fuels. Rangelands 29: 18–24.

Paysen, T.E., R.J. Ansley, J.K. Brown, G.J. Gottffried, S.M. Haase, M.G. Harrington, M.G. Narog, S.S.Sackett, R.C.Wilson. 2000. Pp. 121.159 In: Brown, James K.; Smith, Jane

Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen.Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S.Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Pellant, M. Makela, P. Dragt, B. Washa, B. Ryan, P. Rose, J. Major, Don. 2010. Considerations for Strategically Reducing Fuels and Wildfires on Public Lands in the Great Basin with Targeted Grazing. Great Basin Restoration Initative Workgroup. Bureau of Land Management. Boise, ID.

Strand, E.K., Launchbaugh, K.L. 2013. Livestock Grazing Effects on Fuel Loads for Wildland Fire in Sagebrush Dominated Ecosystems. Great Basin Fire Science Delivery Report. University of Idaho. Moscow, ID.

Swetnam, T.W. and C.H. Baisan. 1996. Historical Fire Regime Patterns in the Southwestern United States Since AD 1700. Pp. 11.32 In: Allen, C.D., ed., Fire effects in southewestern forests: Proceedings of the second La Mesa fire symposium. General Technical Report RB-GTR-286, USDA, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Wohlegmuth, P.M., J.L. Beyers, and S.G. Conard. 1999. Postfire hillslope erosion in Southern California Chaparral: A case study of prescribed fire as a sediment management tool. In: Proceedings of the Symposium on Fire Economics, Planning, and Policy: Bottom Lines. USDA Forest Service General Technical Report PSW-GTR-173, 332, pp. 269-276. Albany, CA: Pacific Southwest Research Station, Forest Service, US Department of Agriculture.